CLAIMS

1. An aluminum electrolytic capacitor comprising an anode, a cathode comprising aluminum and an electrolytic solution containing an onium salt of fluorine-containing anion, wherein the electrolytic solution has a water concentration of 1% by weight or less.

2. An aluminum electrolytic capacitor comprising an anode, a cathode comprising aluminum and an electrolytic solution containing an onium salt of fluorine-containing anion, wherein the cathode has a peak top of Al2p spectrum of 74.0 to 75.8 eV as measured by a method in which the surface of the cathode in the aluminum electrolytic capacitor heated at 125°C for 50 hours is analyzed by X-ray photoelectron spectroscopy (XPS).

3. The aluminum electrolytic capacitor according to claim 2, wherein the electrolytic solution has a water concentration of 1% by weight or less.

4. The aluminum electrolytic capacitor according to any one of claims 1 to 3, wherein the fluorine-containing anion is an anion represented by the following formula (a):

$$MFn^- \qquad (a)$$

wherein:

M represents an element selected from the group consisting of B, Al, P, Nb, Sb and Ta; and

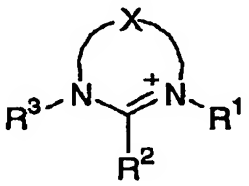
n represents a number of 4 or 6.

5. The aluminum electrolytic capacitor according to any one of claims 1 to 4, wherein the onium salt is at least one member selected from the group consisting of a

quaternary ammonium salt, a quaternary phosphonium salt, a quaternary imidazolium salt, a quaternary amidinium salt and an ammonium salt.

6. The aluminum electrolytic capacitor according to any one of claims 1 to 5, wherein the aluminum electrolytic capacitor is assembled in an atmosphere having a moisture content of 50% or less in terms of a relative humidity.

7. An electrolytic solution for electrolytic capacitor, comprising a quaternary cyclic amidinium tetrafluoroaluminate represented by the following formula (1) and a solvent, and the electrolytic solution containing compounds represented by the following formulae (2) to (4) in a total amount of 0.6% by weight or less:



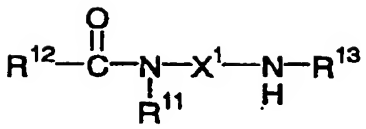
AlF_4^- (1)

wherein:

each of R^1 to R^3 independently represents an alkyl group which may be substituted, a cycloalkyl group which may be substituted, an aryl group which may be substituted or an aralkyl group which may be substituted;

X represents an alkylene group which may be substituted or an arylene group which may be substituted; or

any of two selected from R^1 to R^3 and X may be connected together to form a ring, wherein the ring may have a nitrogen atom(s) in addition to the nitrogen atoms in the formula (1),



(2)

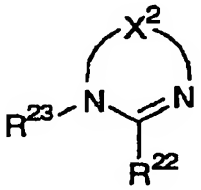
wherein:

each of R^{11} to R^{13} independently represents a hydrogen atom, an alkyl group which may be substituted, a cycloalkyl group which may be substituted, an aryl group which may be substituted or an aralkyl group which may be substituted;

X^1 represents an alkylene group which may be substituted or an arylene group which may be substituted; or

any of two selected from R^{11} to R^{13} and X^1 may be connected together to form a ring, wherein the ring may have a nitrogen atom(s) in addition to the nitrogen atoms in the formula (2),

wherein the amino group may be protonated to form a salt,



(3)

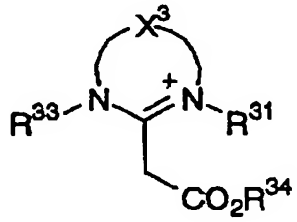
wherein:

each of R^{22} and R^{23} independently represents a hydrogen atom, an alkyl group which may be substituted, a cycloalkyl group which may be substituted, an aryl group which may be substituted or an aralkyl group which may be substituted;

X^2 represents an alkylene group which may be substituted or an arylene group which may be substituted; or

any of two selected from R^{22}, R^{23} and X^2 may be connected together to form a ring, wherein the ring may have a nitrogen atom(s) in addition to the nitrogen atoms in the formula (3),

wherein the amidine group may be protonated to form a salt,



AlF_4^- (4)

wherein:

each of R^{31}, R^{33} and R^{34} independently represents an alkyl group which may be substituted, a cycloalkyl group which may be substituted, an aryl group which may be substituted or an aralkyl group which may be substituted;

X^3 represents an alkylene group which may be substituted or an arylene group which may be substituted; or

any of two selected from R^{31}, R^{33} and X^3 may be connected together to form a ring, wherein the ring may have a nitrogen atom(s) in addition to the nitrogen atoms in the formula (4).

8. The electrolytic solution according to claim 7, wherein the salt represented by the formula (1) above is at least one member selected from 1-ethyl-2,3-dimethylimidazolinium tetrafluoroaluminate and 1,2,3,4-tetramethylimidazolinium tetrafluoroaluminate.

9. The electrolytic solution according to claim 7 or 8,

wherein the compounds represented by the formulae (2) to (4) above are at least one member selected from N-(1-methyl-2-aminoethyl)acetamide, N-(2-methyl-2-aminoethyl)acetamide, N-methyl-N-(1-methyl-2-aminoethyl)acetamide, N-(2-methyl-2-methylaminoethyl)acetamide, N-(2-ethylaminoethyl)acetamide, N-(2-aminoethyl)-N-ethylacetamide, N-(2-ethylaminoethyl)-N-methylacetamide, N-ethyl-N-(2-methylaminoethyl)acetamide, N-methyl-N-(1-methyl-2-methylaminoethyl)acetamide, N-methyl-N-(2-methyl-2-methylaminoethyl)acetamide, 1-ethyl-2-methylimidazoline, 1,2,4-trimethylimidazoline, 2,4-dimethylimidazoline, 2-imidazoline, 1-ethyl-2-methoxycarbonylmethyl-3-methylimidazolinium and 2-methoxycarbonylmethyl-1,3,4-trimethylimidazolinium.

10. The electrolytic solution according to any one of claims 7 to 9, wherein the solvent comprises at least one member selected from γ-butyrolactone, sulfolane and 3-methylsulfolane.

11. The electrolytic solution according to any one of claims 7 to 10, wherein the quaternary cyclic amidinium tetrafluoroaluminate is a salt purified by recrystallization.

12. An electrolytic capacitor using the electrolytic solution according to any one of claims 7 to 11.

13. A method for preparing an organic onium tetrafluoroaluminate which comprises reacting (i) hydrogen fluoride and/or fluorosilicic acid; (ii) an organic onium salt; and (iii) an aluminum compound with the proviso that aluminum trifluoride is excluded, and/or metallic aluminum.

14. The method according to claim 13, wherein the organic onium salt is represented by any one of the

following formulae (5) to (7):

$$QOH \quad (5)$$

$$QROCO_2 \quad (6)$$

$$QX \quad (7)$$

wherein:

Q represents an organic onium;

R represents a hydrogen atom or an alkyl group having 10 carbon atoms or less; and

X represents a halogen atom.

15. The method according to claim 13 or 14, wherein the organic onium salt is at least one member selected from an organic onium hydroxide, an organic onium methylcarbonate, an organic onium hydrogencarbonate and an organic onium fluoride.

16. The method according to any one of claims 13 to 15, wherein the organic onium is represented by the following formula (8):

$$\begin{array}{c} R_1 \\ | \\ R_4-A^+-R_2 \\ | \\ R_3 \end{array} \quad (8)$$

wherein:

each of R_1 to R_4 independently represents a hydrogen atom, an alkyl group which may be substituted, a cycloalkyl group which may be substituted, an aryl group which may be substituted or an aralkyl group which may be substituted, with the proviso that two or more of R_1 to R_4 are not hydrogen atoms at the same

time; or part of or all of R_1 to R_4 may be connected together to form a ring, and when the ring is formed, the ring may have a nitrogen atom(s) on the ring composed; and

A represents a nitrogen atom or a phosphorus atom.

17. The method according to any one of claims 13 to 16, wherein the organic onium is at least one member selected from a quaternary ammonium, a quaternary phosphonium, a quaternary imidazolium, a quaternary cyclic amidinium and ammonium.

18. The method according to any one of claims 13 to 17, wherein the organic onium has 4 to 12 carbon atoms in total.

19. The method according to any one of claims 13 to 18, wherein the organic onium is selected from 1-ethyl-2,3-dimethylimidazolinium and 1,2,3,4-tetramethylimidazolinium.

20. The method according to any one of claims 13 to 19, wherein the aluminum compound and/or metallic aluminum is at least one member selected from aluminum hydroxide, aluminum oxide, metallic aluminum and aluminum chloride.

21. The method according to any one of claims 13 to 20, wherein the hydrogen fluoride is used in an amount 3 to 5 times the molar amount of aluminum in the aluminum compound and/or metallic aluminum.

22. The method according to any one of claims 13 to 21, wherein the fluorosilicic acid is used in an amount 0.5 to 0.83 time the molar amount of aluminum in the aluminum compound and/or metallic aluminum.

23. An electrolytic solution for electrolytic capacitor

using an organic onium tetrafluoroaluminate prepared by the method according to any one of claims 13 to 22.

24. An electrolytic capacitor using the electrolytic solution for electrolytic capacitor according to claim 23.